

## WHAT IS CLAIMED IS:

1. A fuel injection valve comprising:
  - a valve seat and a valve disc arranged detachably from and attachably to said valve seat;
  - 5 two fuel injection holes arranged in a downstream side of said valve seat; and
  - 10 swirl force adding means for adding a swirl force to fuel, said swirl force adding means being arranged in an upstream side of said fuel injection holes and in a downstream side of said valve seat corresponding to each of said fuel injection holes so that fuel may be sprayed through said two fuel spay holes toward two directions.
- 15 2. A fuel injection valve according to claim 1, wherein  
said swirl force adding means comprises a through hole penetrating from an upstream side end surface of a plate member to a downstream side end surface; and a fuel passage for introducing fuel into said through hole toward a direction offset in regard to a center of said through hole, and said swirl force adding means are formed in said plate member positioned in an upstream side of said fuel injection holes, and said swirl force adding means are juxtaposed in a surface direction of said plate member.
- 25 3. A fuel injection valve according to claim 1, which comprises:
  - a first plate member having two fuel injection holes,

5 said two fuel injection holes penetrating through said first plate member from an upstream side end surface to a downstream side end surface so as to be directed in directions different from each other, said two fuel  
10 injection holes being independently juxtaposed in a surface direction of the upstream side end surface and the downstream side end surface; and

10 a second plate member having said two swirl force adding means, said two swirl force adding means being formed of two through holes penetrating through said second plate member from an upstream side end surface to a downstream side end surface and independently juxtaposed in a surface direction of the upstream side end surface and the downstream side end surface; and fuel passages provided  
15 in said individual through holes, said fuel passage being directed toward a direction offset with respect to a center of said fuel passage to communicate with said fuel passage, wherein

20 said first plate member and said second plate member are piled up in order of said first plate member and said second plate member from the downstream side of fuel flow so that said two through holes of said second plate member individually communicate with said two fuel injection holes of said first plate member.

25

4. A fuel injection valve according to claim 1, which comprises:

a first plate member having two fuel injection holes,  
said two fuel injection holes penetrating through said  
first plate member from an upstream side end surface to a  
downstream side end surface so as to be directed in  
5 directions different from each other, said two fuel  
injection holes being independently juxtaposed in a surface  
direction of the upstream side end surface and the  
downstream side end surface;

10 a second plate member having said two swirl force  
adding means, said two swirl force adding means being  
formed of two through holes penetrating through said second  
plate member from an upstream side end surface to a  
downstream side end surface and independently juxtaposed in  
15 a surface direction of the upstream side end surface and  
the downstream side end surface; and fuel passages provided  
in said individual through holes, said fuel passage being  
directed toward a direction offset with respect to a center  
of said fuel passage to communicate with said fuel passage;  
and

20 a third plate member having passage wall surfaces  
forming fuel passages communicating from an upstream side  
end surface to a downstream side end surface of said third  
plate member, wherein

said first plate member and said second plate member  
25 and said third plate member are piled up in a downstream  
side of said valve seat in order of said first plate member,  
said second plate member and said third plate member from

the downstream side so that said fuel passages of said third plate member communicate with said fuel passages of said second plate member, and said two through holes of said second plate member individually communicate with said 5 two fuel injection holes of said first plate member.

5. A fuel injection valve according to any one of claims 1 to 4, wherein penetrations of fuel sprays injected from said two fuel injection holes are made different from each 10 other by making swirl forces added to the fuel different between said two swirl force adding means.

6. A fuel injection system comprising an intake pipe for supplying air to an internal combustion engine; an intake 15 air flow control device for controlling an air flow flowing inside said intake pipe; and a fuel injection valve for injecting fuel, said fuel injection valve being arranged at a position downstream of said intake air flow control device inside said intake pipe, wherein

20 said fuel injection valve comprises:

a valve seat and a valve disc arranged detachably from and attachably to said valve seat;

two fuel injection holes arranged in a downstream side of said valve seat; and

25 swirl force adding means for adding a swirl force to fuel, said swirl force adding means being arranged in an upstream side of said fuel injection holes and in a

downstream side of said valve seat corresponding to each of said fuel injection holes so that fuel may be sprayed through said two fuel spray holes toward two directions.

5 7. A fuel injection valve comprising:

a valve seat and a valve disc arranged detachably from and attachably to said valve seat;

a fuel injection hole for injecting fuel in two directions, said fuel injection hole being arranged in a downstream side of said valve seat; and

means for making penetration different between fuel sprays injected in individual directions.

8. A fuel injection system comprising an intake pipe for supplying air to an internal combustion engine; an intake air flow control device for controlling an air flow flowing inside said intake pipe; and a fuel injection valve for injecting fuel, said fuel injection valve being arranged at a position downstream of said intake air flow control device inside said intake pipe, wherein

said fuel injection valve is a fuel injection valve for injecting fuel in two directions, and said fuel injection valve has a means for making penetration different between fuel sprays injected in individual directions.

9. A fuel injection system according to claim 8, wherein  
said intake air flow control device is arranged so  
that air flow rates supplied to the individual two fuel  
sprays injected from said fuel injection valve toward the  
5 two directions can be changed.

10. A fuel injection system according to claim 9, wherein  
a rotation shaft of an opening-and-closing valve of  
said intake air flow control device and a valve stem of  
10 said fuel injection valve are arranged in parallel to each  
other, and

15 said fuel injection valve injects fuel so that one  
fuel spray between said two fuel sprays is directed one  
side of a plane including said rotation shaft and said  
valve stem as a boundary, and the other fuel spray between  
said two fuel sprays is directed the other side of said  
plane as the boundary.

11. A fuel injection system according to claim 8, wherein  
20 as said means for making the penetration different,  
number of fuel injection small holes for forming one fuel  
spray is set to a different number between said two fuel  
spray so that the penetrations of said two fuel sprays may  
be different from each other.